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ORIGINAL ARTICLE

Degree of urbanization and gender differences in substance use among Slovak adolescents

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Abstract
Objectives Substance use among adolescents varies with gender and between countries. Urbanization may contribute to this. The aim of our study is to explore the association between the degree of urbanization and gender differences in adolescent smoking, binge drinking, and cannabis use.
Methods A cross-sectional questionnaire survey of Slovak adolescents was used ($N = 3{,}493$; mean age = 14.33), stratified by degree of urbanization. The effects of gender and urbanization of the area and their interaction on substance use (smoking, binge drinking, and cannabis) were analyzed using a logistic regression model adjusted for age.
Results Gender and area and their interaction had statistically significant ($p < 0.01$) associations with substance use. The lower the urbanization of the area, the less riskily females behaved. An exception was found in the case of binge drinking where the results of the interaction of gender and degree of urbanization were not significant for the second least urbanized area.
Conclusions Prevalence rate of substance use among girls increased along with an increasing degree of urbanization, while the prevalence rate of substance use among boys remained constant.

Keywords Gender differences · Urbanization · Substance use · Smoking · Alcohol · Cannabis

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Introduction

In most countries, boys tend to engage more frequently in most adverse health-related behavior (HRB) than girls (Geckova et al. 2002; Ilhan et al. 2009; Isralowitz and Rawson 2006; Makela et al. 2006; Piko and Fitzpatrick 2007). However, this pattern does not seem to be universal. It varies with time (Abbott-Chapman et al. 2008; Pitel et al. 2010), country (Currie et al. 2004; Baska et al. 2009), degree of urbanization within a country (Cronk and Sarvela 1997), age, and socioeconomic position (Salonna et al. 2008; Williams et al. 2007).

Gender differences in substance use are probably strongly related to culturally bound gender roles (Van Gundy et al. 2005). Extreme examples of the impact of gender roles on gender disparities in HRB can be found in Islamic societies, in which there is traditionally a much higher prevalence of smoking (Ghouri et al. 2006) and also alcohol and drug addiction (Hafeiz 1995) among males than among females. Gender is a strong predictor of HRB in North America and Europe as well, but its impact varies with country and age group (Graham 1996; Makela et al. 2006). Moreover, gender patterns are not stable over time. For instance, the gender ratio regarding smoking has

shifted (or is still shifting) from a higher prevalence rate among males towards equalization, or even a higher prevalence rate among females in the UK (Matheson and Summerfield 2000) and in several other Western and Southern European countries (Graham 1996). This also holds true for adolescents, e.g., in England smoking prevalence rates were rather equal by gender in the early 1980s, and a decline in the male smoking and rise in female smoking occurred in the mid 1980s. This has led to higher prevalence rates of smoking among girls compared to boys since then.

A rather uneasy societal transition from a socialist system to a market-oriented one took place during the 1990s in Slovakia. Concurrently, the country opened itself to aggressive advertising of Western tobacco corporations without having any legislative control mechanisms in that period. The first (insufficient) law, which regulated smoking in public places, was just passed in 1997 and its stronger upgrades followed in 2006 and 2009. It is likely that these circumstances influenced the uptake of substance use in the transitional countries in the 1990s (Puska 1997). The social turmoil connected with the transition also may have influenced differences in substance use by gender but evidence is lacking about this.

During this transition, adolescent substance use among Slovak adolescents indeed increased. Representative studies of substance use among Slovak adolescents during this period are the Health Behaviour in School-aged Children (HBSC) studies, with data collections in 1993–1994 and 1997–1998 (King et al. 1996; Currie et al. 2000) and the European School Survey Project on Alcohol and Other Drugs (ESPAD) studies with data collections in 1995, 1999, and 2003 (Hibell et al. 1997, 2000, 2004). The HBSC studies show an increase of smoking and binge drinking in the mid-1990s (King et al. 1996; Currie et al. 2000) among Slovak adolescents. The ESPAD studies indicate a further continued increase in smoking, binge drinking and in cannabis initiation from 1995 to 1999. While the smoking prevalence rates remained relatively stable between 1999 and 2003, the prevalence rates of binge drinking and cannabis lifetime use kept increasing during that period (Hibell et al. 1997, 2000, 2004) in Slovakia. Although the prevalence rate of self-reported substance use was higher among boys in the beginning of the explored period, the prevalence rate among girls increased faster and eventually, gender differences in these three kinds of substance use decreased over time.

Sociocultural patterns in substance use do not only vary between nations but may also differ within countries, for example, according to the degree of urbanization. In adults, a higher degree of urbanization seems to increase probability of substance use (Sundquist and Frank 2004), particularly among females (Pomerleau et al. 2004; Idris et al. (2007)). Regarding adolescents, Cronk and Sarvela (1997) reported that in 1976 use of most substances was more prevalent among urban adolescents compared to rural. However, until 1992, the differences between the urban and rural areas decreased. They also found that rural adolescents had higher prevalences for the use of alcohol and tobacco, particularly in excessive use. Similar trends were observed between both genders, although rural girls caught up with later substance use as compared with urban girls. Abraham (1999) found a positive relationship between municipality population density and illicit drug use, cannabis included, in a Dutch population aged 12 and older, but the relationship between gender and drug use prevalence was equivalent in all cities.

The differences in substance use by urbanization and the time trends in gender ratios per country may be related, gender ratios changing faster in for instance urbanized areas than in rural areas. However, studies on the link between urbanization and gender differences in adolescent substance use are very scarce (Cronk and Sarvela 1997; Abraham 1999). Therefore, the aim of our study is to explore the association between the degree of urbanization and gender differences in adolescent smoking, binge drinking and cannabis use.

Methods

Sample

Data were collected between October and December 2006. The sample consisted of 3,725 adolescents in the 8th and 9th grade of randomly selected ordinary elementary schools across Slovakia. We excluded 178 cases from special schools, which were attended by adolescents with special education needs (e.g., a special high school for sportsmen) so that the analyses were performed on a sample consisting of 3,547 adolescents (mean 14.3 years; SD 0.5 years; 49% boys; response rate 93.5%). The primary reasons for non-response were illness and other types of absence. The respondents completed the questionnaire in their classrooms and under the guidance of field workers.

Measures

We obtained data on the use of alcohol, smoking, and the use of hashish/marijuana. These were measured by simple questions about the occurrence and frequency of use. The wording of the questions was derived from the questions from the HBSC studies (Currie et al. 2004). The answers provided were then dichotomized.

For cigarette smoking, the wording of the question was "Have you ever smoked a cigarette (even if only once)?"

Respondents could choose from the options: "I do not smoke," "I have already tried smoking," "I used to smoke but I have ceased completely", "I smoke occasionally but not daily" and "I smoke daily." The indication of risky behavior was current smoking on a daily or occasional basis.

For alcohol consumption, the wording of the question was "Have you been drunk during the past four weeks?" Respondents could choose from the options: "Not even once," "1–2 times," or "3 times and more." All subjects who reported to have been drunk at least once in the previous four weeks were labeled as participating in risky behavior.

For cannabis use, the wording of the question was "Have you ever smoked hashish or marijuana?" Respondents could choose from the options "No, never", "I have tried it already", "I smoke from time to time but not daily," or "I smoke daily." All who reported to have ever smoked hashish or marijuana were labeled as behaving riskily.

Urbanization was measured using four types of areas, which largely differ in degree of urbanization. The most highly urbanized category consisted of adolescents from Bratislava, the biggest Slovak city (population 455,000; regional GDP 14,342 EUR in 2004) and the Slovak capital, situated in the western part of the country. It has a high proportion of university students, is the richest region of the country, and has the lowest unemployment. The second group (high degree of urbanization) consisted of adolescents from Kosice (population 235,000; regional GDP 4,696 EUR in 2004). It is also a university city but in the eastern part of Slovakia and with much lower incomes and higher unemployment rates than those of Bratislava. The third group (low degree of urbanization) consisted of adolescents from Zilina (population 85,000; regional GDP 5,176 EUR in 2004), a city located in central Slovakia. At the time of the study, rapid economic growth and decrease of the then high unemployment rate started in that region due to huge investments in new automobile manufacturing plants near the city. The fourth group (the lowest degree of urbanization) consisted of adolescents from several smaller towns and villages located in eastern and central Slovakia (population under 40,000; regional GDP 4,696-5,176 EUR in 2004), mostly with low income, high unemployment rates and small proportions of university-educated population (Statistical Office of Slovak Republic 2003; Eurostat News Release STAT/07/23 2007).

Statistical analysis

First, we computed simple prevalence rates for the three kinds of substance use (smoking, binge drinking, and cannabis use) in each of the four residential groups, split by gender. Next, age-adjusted odds ratios for all degrees of urbanization compared to the highest group were calculated for each gender separately. The effects of gender and area and their interaction on substance use for the four levels of urbanization were analyzed using a logistic regression model, also adjusted for age. Statistical analyses were performed with SPSS 14.0.

Results

Smoking

The prevalence rate of smoking among girls decreased from 30 to 16% for the highest compared to the lowest degree of urbanization, whereas among boys it was almost equal for all degrees of urbanization—around 20% (Table 1). Correspondingly, among girls, significantly lower OR of smoking occurred in the low ($p < 0.05$) and the lowest ($p < 0.001$) urbanized areas (Table 2). The odds ratios (OR) of smoking by degree of urbanization were not statistically significant among boys. These differences by gender in the association of smoking with degree of

Table 1 Prevalence rates of three kinds of substance use by degree of urbanization and gender (Slovakia, 2006)

Degree of urbanization	Smoking		Binge drinking		Cannabis use	
	Boys	Girls	Boys	Girls	Boys	Girls
Highest	21.1%	30.6%	20.6%	25.0%	21.5%	18.4%
N	82/389	118/385	77/374	95/380	82/382	70/380
High	21.6%	25.8%	22.4%	19.6%	21.0%	15.1%
N	108/499	145/562	110/491	109/557	104/496	84/556
Low	21.3%	19.2%	14.7%	15.2%	19.1%	6.4%
N	61/287	55/287	41/278	43/283	54/283	18/283
Lowest	19.7%	16.1%	17.9%	11.2%	20.0%	4.0%
N	93/473	77/477	84/469	53/473	94/469	19/477
Total	20.9%	23.1%	19.4%	17.7%	20.5%	11.3%
N	344/1,648	395/1,711	312/1,612	300/1,693	334/1,630	191/1,696

N counts

urbanization are reflected by the OR for their interaction (Table 3).

Binge drinking

The lower the degree of urbanization was, the lower was the prevalence of binge drinking in the previous 4 weeks among girls. Every fourth girl in the most urbanized area reported to have been drunk at least once in the past 4 weeks, which was an even higher rate than among boys in those areas, while in the smallest towns and rural areas only every ninth girl reported such behavior (Table 1).

Among girls, similar differences by urbanization were found as in smoking (Table 2). Among boys, no such pattern by urbanization was observed. The OR was not significantly different between the least and most urbanized areas and no consistent trend was observed either. The interaction between gender and degree of urbanization contributed to the model with statistical significance. Similarly as in smoking, the OR of this interaction was lowest for the least urbanized group, i.e., in that group prevalence rates of girls were lowest compared to boys (Table 3).

Assessment of frequent binge drinking (three times or more last month vs. less) showed roughly similar gradients, but with more chance variation due to the much lower frequency of this behavior (not shown).

Cannabis use

As for cannabis lifetime use, we observed differences among girls in the very same direction, e.g., the lower the degree of urbanization, the lower the prevalence of cannabis use among girls. Only 1 out of 25 girls from the group with the lowest urbanization had ever tried cannabis. The OR of girls from the two lowest urbanized groups was significantly smaller as compared to the highest urbanized one ($p < 0.001$ in both cases). However, prevalence rates among boys are almost equal for all degrees of urbanization. (Tables 1, 2). The interaction between gender and degree of urbanization contributed to the model with statistical significance (Table 3). Significant differences were

Table 2 Odds ratios for substance use due to degree of urbanization for boys and girls separately, adjusted for age (Slovakia, 2006)

	Smoking		Binge drinking		Cannabis use	
	Boys	Girls	Boys	Girls	Boys	Girls
Degree of urbanization						
Highest	1 ns	1***	1 ns	1***	1 ns	1***
High	1.16 (0.83–1.62)	0.82 (0.61–1.10)	1.28 (0.91–1.80)	0.73 (0.53–1.00)	1.14 (0.81–1.60)	0.83 (0.58–1.18)
Low	1.18 (0.79–1.75)	0.62 (0.43–0.91)	0.81 (0.52–1.26)	0.63 (0.42–0.95)	1.11 (0.74–1.67)	0.38 (0.22–0.66)
Lowest	0.99 (0.69–1.40)	0.44 (0.32–0.62)	0.95 (0.66–1.36)	0.37 (0.26–0.54)	1.11 (0.78–1.58)	0.17 (0.10–0.29)

*** $p < 0.001$

ns no significance

Table 3 The effect of gender, degree of urbanization and interaction of gender and degree of urbanization on HRB among adolescents, adjusted for age in odds ratios and 95% confidence intervals in parentheses (Slovakia, 2006)

	Smoking	Binge drinking	Cannabis use
Age	1.51 (1.32–1.73)***	1.66 (1.44–1.93)***	1.81 (1.55–2.11)***
Gender			
Male	1**	1*	1 ns
Female	1.76 (1.26–2.46)	1.45 (1.02–2.07)*	0.94 (0.65–1.36)
Degree of urbanization			
Highest	1 ns	1 ns	1 ns
High	1.15 (0.82–1.60)	1.27 (0.91–1.78)	1.14 (0.81–1.60)
Low	1.16 (0.78–1.71)	0.80 (0.52–1.24)	1.11 (0.74–1.66)
Lowest	0.97 (0.69–1.38)	0.94 (0.65–1.35)	1.11 (0.78–1.57)
Female gender by urbanization			
Highest	1**	1**	1***
High	0.71 (0.46–1.11)	0.58 (0.36–0.92)	0.72 (0.44–1.18)
Low	0.55 (0.32–0.94)	0.80 (0.44–1.45)	0.34 (0.17–0.68)
Lowest	0.45 (0.28–0.73)	0.40 (0.24–0.67)	0.15 (0.08–0.29)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

ns no significance

found between the most urbanized area and the two least urbanized ones. Assessment of occasional or daily cannabis smoking (three times or more last month vs. less) showed similar gradients or less, but with more chance variation due to the much lower frequency of this behavior (not shown).

Discussion

Our study showed gender disparities in smoking, binge drinking, and cannabis use that differed by degree of urbanization. Among boys, no significant differences by urbanization were found regarding the prevalence of substance use. Among them, prevalence rates were very similar for all urbanization levels and for every kind of substance use, about 20%, the only exception being binge drinking in the low urbanized area where this rate was 14.7%. Among girls, a continuous decrease in substance use prevalence was found by decreasing degree of urbanization. Interestingly, the prevalence of smoking and binge drinking among girls from the highest urbanization level was even greater than among the boys from the same urbanization level. The decreasing trend held for all three kinds of substance use that were examined. In particular, among girls, differences between the group with the highest degree of urbanization and the two groups with the lowest degree of urbanization were statistically significant for all three types of HRB.

The prevalence rate of smoking among Slovak adolescents is currently increasing (Hibell et al. 2004; King et al. 1996; Currie et al. 2000). The results of our study indicate that perhaps the process of diffusion of smoking from more urbanized to less urbanized areas occurred some time ago among boys but not among girls. According to Rogers (1962) and Rogers and Shoemaker (1971), new practices tend to be taken up first by communities with relative advantage in socioeconomic status, educational level, and upward social mobility. This is usually the case in more urbanized areas rather than in the less urbanized ones. Additionally, according to Lopez et al. (1994) and Graham (1996), in many previous studies among adults from several European countries, smoking was generally first taken up by males when introduced. Therefore, it can be assumed that it takes a longer time until trends in substance use are adopted by females, especially by those in areas with a lower degree of urbanization. Possibly, current substance use in Slovakia is in a stage in which the new trends were already adopted by boys, regardless of degree of urbanization, but until now only by those girls who live in the most urbanized areas. This also may explain why cannabis had the steepest gradient of gender differences by degree of urbanization. Further research is needed to assess whether the approach of Rogers (1962) and Rogers and Shoemaker (1971) indeed applies to adolescents in the current globalized world and whether the findings of Lopez et al. (1994) and Graham (1996) regarding the smoking epidemic may indeed be applied on other kinds of substance use. International cross-sectional studies in time series on several kinds of adolescent substance according to degree of urbanization use are required to confirm this.

Another possible explanation is that the diffusion of substance use already occurred but for some reasons the behaviors were not adopted by girls in the areas with lower degrees of urbanization. Perhaps the social attitude towards female substance use is simply more conservative in areas with low degree of urbanizations or it is a consequence of a more general traditional patriarchal socialization patterns regarding gender roles. According to the power-control theory verified by Grasmick et al. (1996) on American adolescents, girls from more patriarchal families showed a lower taste for risk, globally defined, than boys. In less patriarchal families, no such a gender difference occurred. Similarly, Emslie et al. (2002) found that the personal trait of masculinity rather than actual gender was positively associated with smoking and heavy drinking. Unfortunately, our data did not allow us to include family socialization patterns or masculinity in the analysis.

Strengths and limitations

The validity of our study is supported by its high response rate, which largely limits the likelihood of selection bias. Due to the anonymous character of the study and the fact that data were collected by trained social workers instead of teachers, social desirability and selective responding were prevented to a high extent. Moreover, the wording of the questions was as clear and short as possible, being derived from questions on the HBSC studies (Currie et al. 2004), which were tested for both internal and external validity several times before.

However, the cross-sectional design of the study limits its potential for causal inferences and for the assessment of trends in time. A repeated cross-sectional design may enable the latter, in particular to test our hypothesis on picking up trends in girls.

Implications

Our study shows that the likelihood of adolescent health endangering behaviors is higher in highly urbanized areas, in particular among girls. Its findings suggest that health policy makers should pay attention to this unequal distribution and should adapt prevention programs accordingly. Girls in big cities seem to deserve special attention. Secondary prevention efforts should thus specifically be

targeted on this group. However, studies on trends from Western countries (Daponte-Codina et al. 2009) indicate that the smoking epidemic is going to occur among females in low urbanized areas as well, only with a certain delay. Thus, regional disparities might diminish in the future due to rising substance use prevalence among rural girls. Policymaking for regions where the prevalence rates of smoking among girls are still low should focus on preventing the probable impending smoking epidemic through primary prevention activities.

Future studies which evaluate the factors associated with smoking, binge drinking and cannabis use for both genders are needed to gain deeper insights into the explanation of the present results. Besides, future repeated surveys will be needed to confirm whether our findings are indeed due to gender differences in the timing of behavioral changes by urbanization. This may add to the prevention of adverse health behaviors as well as the retention of healthy ones.

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Conflict of interest The authors declare that they have no competing interests.

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